

APPENDIX 2. UCD-BML-SCWA ARCIMS GIS PROJECT

The enclosed CDrom contains sample data, programming code and scripted batch files, for the ArcIMS website: <http://sonoma.regis.berkeley.edu/website/bml/salmon>. With the exception of the ESRI software and the Windows 2000 Server operating system, all software is available free of charge from the sources listed below. Information about ArcIMS licensing can be obtained from the URL <http://www.esri.com>. ESRI's ArcView and ArcGIS software packages were also used for pre-processing the geographic data.

We expect and encourage ArcIMS developers to incorporate, borrow and/or modify the methods described here if they are found to be useful.

NOTE: This site may be moved and linked to the following URL at sometime in the near future:
<http://www.bml.ucdavis.edu>

Computing Environment and System Requirements

The software needed to install and run this site includes:

- ESRI ArcIMS 3.1
- Microsoft IIS-Internet Information Server (or Apache 2.0.4 webserver)
- Jakarta-Tomcat 4.0 servlet engine (<http://jakarta.apache.org/>)
- ActiveState ActivePerl 5.6, PERL programming tools (<http://www.activestate.com/>)
- gen2shp.exe (a software utility to create a shapefile(tm) from a text file). "gen2shp.exe" is a third-party GNU general public license utility. Un-compiled C source code and additional information can be found at the URL <http://www.intevation.de/~jan/gen2shp>
- jsImagePlayer (a software utility available at <http://sgi.felk.cvut.cz/~xholecko/>)

The ArcIMS 3.1 GIS data and processing scripts were designed to run on a Windows 2000 or XP server. Contact ESRI for questions regarding installations using alternative operating systems.

Sample Data Layers Enclosed

Samples of the following data layers and the ArcIMS directory structure are included on the enclosed data disk. Many of the raster layers (e.g. 1m DOQQs and DRGs) on the ArcIMS server are very large files. DOQQs for 7.5 minute quads are ~ 160MB in raw form, for example. Smaller subset samples of each data type were included in order to fit a representative sample on a single CDrom. Data layers used in the GIS include:

Live Data

- CODAR ocean surface current measurements (1,200 sq. mile coverage off Marin and Sonoma Counties)
- NOAA Data Buoy Center buoy locations and live-links for central and northern California
- CDEC (California Data Exchange Center) stream monitoring and real-time live-links for the Sonoma and Marin County area
- USGS stream flow gauge locations and real time live-links for the Sonoma and Marin County area

Marine/Stream

- Bathymetry-(10m contours) for northern California coast from 10-600m
- California watershed boundaries, three levels of aggregation
- Marin County streams
- Olema Creek segmented layer with linked sample data (provided as proof-of-concept)

Political/Governmental

- County boundaries and names
- Major roads

Raster/Image Data

- USGS DOQQ samples at 1m and 2m resolution (Digital orthographic quarter-quads, i.e. geo-referenced aerial photographs)
- USGS DRG samples at 1:24K, 1:100K, 1:250K depending on level of zoom (Digital Raster Graphics, i.e. digital topographic maps)

- Shaded relief layer

Salmon Related

- Coho salmon hatchery locations for northern California
- Coho salmon ESU (for Central California)
- Lagunitas Creek coho spawning sites (J. Watters study)

Description of Custom PERL Scripts and CODAR Data Processing

The following scripts are used for processing the real-time CODAR data:

- *codar.bat*
- *ftp_codar_win2k.pl*
- *process_codar_win2k.pl*
- *gen2shp.exe*
- *cleanup_codar_win2k.pl*

Hourly real-time Total Vector Files are incorporated as data layers into the GIS browser. The 24-hour animation tool is linked to the metadata panel on the bottom of the GIS browser window. The direct link to the CODAR animation tool is: <http://sonoma.regis.berkeley.edu/website/bml/codar/animation/jplay.html>

CODAR data is processed as follows:

The batch file *codar.bat* runs every hour as a Windows 2000 "scheduled task". This requires PERL (ActiveState) with CPAN PERL Modules: Net::FTP, Time::ParseDate, Date::Manip and the GNU licensed utility *gen2shp.exe* to be installed.

The batch file first executes *ftp_codar_win2k.pl* which ftp's the BML CODAR server, figures out what the 24 most recent CODAR files are and downloads those that are not already on the ArcIMS server. It then determines the most recent Total Vector File and jpeg picture file and downloads those that are not already on the local system (this is a check against those periods when the FTP server is down, otherwise only the latest file would be needed). It then determines the name of the most recent jpg and TVF files, and copies these to files named *codar_tvf_latest.txt* and *codar_jpg_latest.jpg*. It also makes the *codar.js* file, which is used in the ArcIMS layer list to correctly label the shapefile(tm) with the current date and time.

(Note: CODAR servers are not publicly accessible and require that an ftp account be established for successful login).

The batch file then executes *process_codar_win2k.pl* that converts the CODAR ASCII Total Vector File to an arcgenerate text file (a proprietary format compatible with ESRI GIS software). The execution of *gen2shp.exe* creates the CODAR vector shapefile(tm) layer in the GIS.

The final batch process is execution of *cleanup_codar_win2k.pl* which removes temporary files and files used for creation of the preceding sample. This script creates sorted lists of the latest CODAR jpg and TVF files on the file system, uses the copy command to create the CODAR animation jpg files from the 24 most recent jpg files (named *codar1.jpg* to *codar24.jpg*) and then deletes all but the 24 most recent CODAR jpg and Total Vector Files.

The CODAR animation is displayed using a simple Javascript(tm) tool, *jsImagePlayer*, so that it can be run in most web browsers without the user needing to download a plug-in.

Description and Processing of Live-link Data Sources

The following text describes how the live web-based data sources were incorporated into the ArcIMS site:

Example 1:

NOAA Data Buoy Center (NDBC)

URL <http://www.ndbc.noaa.gov/>

The NDBC develops, operates, and maintains a network of buoy and C-MAN stations.

All stations measure wind speed, direction, and gust; barometric pressure; and air temperature. In addition, all buoy stations, and some C-MAN stations, measure sea surface temperature, salinity, wave heights and periods. See the website for more information.

Processing Steps:

1. Go to NDBC web site
2. Use buoy station map to identify name, location, and id of all buoys in northern California (north of Monterey Bay).
3. Input this info into a text file in the following format:

```
-----  
LATITUDE, LONGITUDE, ID, NAME, DESC  
41.85, -124.38, 46027, ST Georges, Northern CA NOAA National Data Buoy Station  
40.72, -124.52, 46022, Eel River, Northern CA NOAA National Data Buoy Station  
-----
```

4. Convert the list of stations to a shapefile in ArcView
5. Using the arcIMS hyperLink functionality (implemented in the arcIMSParam.js file) use the Station ID field to link station points in ArcIMS to data page on the CDEC website, like so:
hyperLinkLayers[2] = "NOAA NDBC Stations";
hyperLinkFields[2] = "ID";
hyperLinkPrefix[2] = "http://www.ndbc.noaa.gov/station_page.phtml?\$station=";
6. The hyperlink information is then used to launch related real-time data web pages on the NDBC website (e.g. [http://www.ndbc.noaa.gov/station_page.phtml?\\$station=46026](http://www.ndbc.noaa.gov/station_page.phtml?$station=46026))
Last updated 09/13/02

Example 2:

California DWR Data Exchange Center (CDEC) River Stage Data

URL is <http://cdec.water.ca.gov>

Attributes: stream flow, precipitation, humidity air temperature, river stage

Processing steps:

1. Go to CDEC Web site
2. Go to List of all Real-Time Reporting Stations, Sorted By Station Name (our list represents those stations last UPDATED: 05/03/2002).
<http://cdec.water.ca.gov/misc/realStations.html>
3. Save the list of stations as a textfile
4. Subselect only the stations in the following 4 counties:
Marin, Napa, Sonoma, Mendocino.
5. Reformat as textfile in MS Excel as comma delimited text file, with field names, like this:

```
-----  
Station ,ID ,Elev ,Latitude ,Longitude,County ,River Basin  
ARROYO CORTE MADERA MILL VALLEY,ACM,3,37.898,-122.535,MARIN,SF BAY  
-----
```

6. Convert the list of stations to a shapefile in ArcView
 7. Using the arcIMS hyperLink functionality (implemented in the arcIMSParam.js file) use the Station ID field to link station points in ArcIMS to data page on the CDEC website, like so:
hyperLinkLayers[1] = "CDEC River Stage Data";
hyperLinkFields[1] = "ID";
hyperLinkPrefix[1] = "http://cdec.water.ca.gov/cgi-progs/plotReal?staid=";
- (e.g. <http://cdec.water.ca.gov/cgi-progs/plotReal?staid=ACM>)
Last updated 09/13/02 by Patty Frontiera

Example 3:

USGS Stream Flow Data

URL <http://waterdata.usgs.gov/ca/nwis/>

Attributes: stream flow, water temperature, suspended sediments, river stage

The USGS NWIS Webdata website contains location and general information about ground water, surface water, and meteorological sites, including realtime data on current conditions transmitted from selected surface-water, ground-water, and water-quality sites.

Our shapefile of CA NWIS real-time sites on the BML-Salmon Site, represents those sites identified on the NWIS Webdata site on: 2002-07-24 14:05:51 EDT

Processing Steps:

1. Go to USGS NWIS webdata web site for California
<http://waterdata.usgs.gov/ca/nwis/>
2. Go to Real-time Data > Build table (<http://waterdata.usgs.gov/ca/nwis/current>)
3. Select "county" as the only site selection criteria and then click "submit"
(http://waterdata.usgs.gov/ca/nwis/current?search_criteria=county_cd&submitted_form=introduction)
4. On next form:
 - a) under the Select Sites section, select four counties (Marin, Mendocino, Napa, Sonoma)
 - b) Then, under "Choose Output Format" section, select "Site-description information displayed in Tab-separated format"
 - c) Under this, select the following fields: Agency, Site identification number, Site name, Decimal latitude, Decimal longitude, County code
5. Save the resultant web page as a textfile.
6. Reformat this textfile in Excel as comma delimited text file, for example:

```
-----  
SITENO,SITEID,STATION,LAT,LONG,CO_CODE  
1,11460400,LAGUNITAS C A SP TAYLOR STATE PK CA,38.0269,-122.7353,41  
2,11460600,LAGUNITAS C NR PT REYES STATION CA,38.0803,-122.7833,41  
3,11460750,WALKER C NR MARSHALL CA,38.1758,-122.8172,41  
4,11462500,RUSSIAN R NR HOPLAND CA,39.0267,-123.1294,45  
-----
```

7. Convert the list of stations to a shapefile in ArcView
8. Using the arcIMS hyperLink functionality (implemented in the arcIMSParam.js file) use the Station ID field to link station points in ArcIMS to data page on the CDEC website, like so:

```
hyperLinkLayers[0] = "USGS Streamflow Data";  
hyperLinkFields[0] = "SITEID";  
hyperLinkPrefix[0] = "http://waterdata.usgs.gov/ca/nwis/uv/?site_no=";  
hyperLinkSuffix[0] = "&agency_cd=USGS";
```
9. The hyperlink information is then used to launch related real-time data web pages on the NDBC website, Example:
[http://www.ndbc.noaa.gov/station_page.phtml?\\$station=4602](http://www.ndbc.noaa.gov/station_page.phtml?$station=4602)

Projection Information

The shapefile created by the above process is in unprojected, geographic coordinates. However, the data served by ArcIMS for this project is in UTM Zone 10, NAD83. To resolve this, ArcIMS is used to reproject the shapefile on the file to UTM. Since it is such a small file, there is negligible performance issue.

Additional Information

See the file `codar_readme2.txt` on the CDrom for more details on the scripts used to process the codar data and installation notes. For information regarding the development of this site, contact Patty Frontiera at pattyf@regis.berkeley.edu or visit <http://www.regis.berkeley.edu>. For information on CODAR Ocean Sensors email support@codaros.com or visit <http://www.codaros.com>.